

## PATENT ABSTRACTS OF JAPAN

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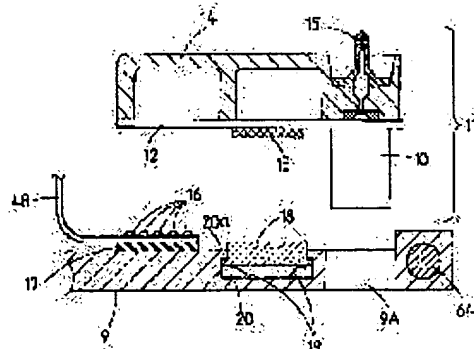
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### (54) INK JET RECORDING DEVICE

#### (57)Abstract:

**PROBLEM TO BE SOLVED:** To reduce the weight and cost of the unit of an ink jet head as an exchange part by a method wherein a heat sink is provided on a carriage side.

**SOLUTION:** In an ink jet recording device, in which recording is performed by jetting ink against printing paper from the nozzle of an ink jet head 10, a unit 11 containing an ink jet head 10, its driver IC 13 and a board 12 is detachably installed on a carriage 9 travelling along a recording region. Further, a heat sink 18 is provided through leaf springs 19 to the carriage 9 side so as to bring the heat sink 18 in tight contact with the driver IC 13 under the condition that the unit 11 is installed on the carriage 9 and, in addition, bring the board 12 in contact with a signal cable 48, resulting in necessitating neither heat sink nor signal cable on the unit 11.



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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the ink jet recording apparatus which prepared in carriage the radiator material which emits further the heat which a drive circuit generates to a detail about the ink jet recording apparatus for which an ink jet head is exchangeable with the drive circuit, and attained simplification of a substitute part.

[0002]

[Description of the Prior Art] The ink jet recording device which injects ink on the recorded body from the nozzle of an ink jet head, and performs printing record conventionally is used. He forms movable carriage along a record section, and is trying to carry the ink tank which supplies ink to this carriage at an ink jet head and this in this kind of ink jet recording apparatus. And it enables it to exchange easily, when the time of exhausting ink by making possible desorption of this ink jet head and an ink tank and an ink jet head break down, and when changing a color.

[0003] On the other hand, with an ink jet head, the cure against heat is needed. It is because ink is injected by pressurizing the ink room which is open for free passage for a nozzle with an ink jet head by a piezoelectric device etc., so it has the driver IC (drive circuit) for driving a piezoelectric device etc. and this driver IC generates heat. If the cure against heat is inadequate, for example, there is a possibility that the function of the driver IC itself may be spoiled, and with the heat, the viscosity of ink will fall, an injection property will change, and desired printing quality will no longer be acquired. Furthermore ink will dry and solidify and the trouble of the injection from a nozzle becoming impossible etc. will be produced.

[0004] So, in the conventional ink jet recording device, although indicated by JP,5-84911,A, for example, thermally conductive good metal radiator material (heat sink) was attached to the ink jet head which has a driver IC like, and it considered as one unit (ink jet unit), and this ink jet unit was used as the substitute part in which desorption is possible at carriage.

[0005]

[Problem(s) to be Solved by the Invention] However, in the ink jet recording apparatus in recent years, since the number of nozzles of an ink jet head increases for improvement in record resolution and drive frequency is increasing for improvement in the speed of a recording rate, the calorific value of a driver IC increases remarkably, and the heat capacity for which a heat sink is asked for this reason is also large. Therefore, it is necessary to use the expensive ingredient which enlarges a heat sink or is excellent in thermal conductivity or heat dissipation nature, and a cost rise is caused further. Moreover, it is not desirable in a cost problem or an environmental problem to also make the expensive ingredient throwing away with the ink jet unit which is a substitute part.

[0006] This invention is made in order to cancel said conventional trouble, and invention of claim 1 aims at offering the ink jet recording device which it prepared and had [ recording device ] radiator material in the carriage side, and decreased the weight and cost of a unit of the ink jet head which is a substitute part.

[0007] And invention of claim 2 aims at offering the ink jet recording device which was made to stick further the radiator material which is a fixing component, and the drive circuit which is the heating element prepared in the substitute part side in invention of claim 1, and improved heat dissipation effectiveness.

[0008] And invention of claim 3 constitutes a unit in support of them in the substrate while connecting a drive circuit with the ink jet head which is a substitute part with the circuit pattern on a substrate further in invention of claim 1 or claim 2, and it aims at offering the ink jet recording device which simplified structure of a substitute part.

[0009] And invention of claim 4 contacts the drive circuit of a unit to radiator material, and aims at offering the ink jet recording device which made exchange easy at the same time it connects a unit to the signal cable on carriage, when equipping carriage with a unit further in invention of either claim 1 thru/or claim 3.

[0010]

[Means for Solving the Problem] Invention which relates to claim 1 in order to attain this purpose In the ink jet recording device which records by injecting ink on the recorded body from the nozzle of an ink jet head The carriage which equips with a unit including said ink jet head and its drive circuit possible [ desorption ], It has the radiator material prepared in this carriage, and is characterized by preparing this radiator material in the location which touches said drive circuit when said carriage is equipped with said unit.

[0011] And the ink tank having the ink supplied to an ink jet head besides an ink jet head and its drive circuit may also be included in a unit here.

[0012] In this ink jet recording apparatus, if carriage is equipped with a unit, the radiator material by which the drive circuit of an ink jet head was established in carriage will be contacted. Therefore, by driving an ink jet head, the heat which a drive circuit emits is transmitted to radiator material, and stripping is carried out through this radiator material. Thereby, heat damage is prevented. In case units are exchanged, radiator material remains in carriage and the same radiator material functions similarly to a new unit. Therefore, it is not necessary to equip a unit with the means for a heat dissipation function.

[0013] Moreover, invention concerning claim 2 is an ink jet recording apparatus concerning claim 1, and when said carriage is equipped with said unit, it is characterized by establishing further a press means to press said radiator material in said drive circuit. This press means is realizable with a spring or rubber, such as a flat spring and a coil spring, etc.

[0014] In this ink jet recording apparatus, when having equipped carriage with the unit, radiator material is pressed by the drive circuit with a press means, and adhesion with radiator material and a drive circuit is achieved. Thereby, the transfer to the radiator material of the generating heat of a drive circuit is ensured.

[0015] Moreover, invention concerning claim 3 is an ink jet recording apparatus according to claim 1 or 2, and is characterized by equipping said unit with the substrate which supports said ink jet head and its drive circuit, and the circuit pattern which is prepared on this substrate and connects said ink jet head and its drive circuit.

[0016] In this ink jet recording apparatus, while an ink jet head and a drive circuit are connected with the circuit pattern on a substrate, they are supported by the substrate. Thereby, unitization of the substitute part is carried out and structure becomes easy.

[0017] Moreover, invention concerning claim 4 is an ink jet recording apparatus according to claim 1 to 3, and said carriage is characterized by having the signal cable which has the contact in which said drive circuit and connection are possible in an opposed face with said unit movable along a record section, and said radiator material.

[0018] In this ink jet recording apparatus, when equipping carriage with the unit which is a substitute part, a drive circuit is contacted [ coincidence ] by radiator material for an ink jet head and a drive circuit to be connected to the signal cable on carriage. Thereby, exchange can be performed easily.

[0019]

[Embodiment of the Invention] The gestalt of the operation which materialized the ink jet recording

device concerning this invention hereafter is explained referring to a drawing.

[0020] The ink jet recording device is equipped with the recorded body, for example, the conveyance device in which a print sheet S is conveyed with two or more rollers 62, and the carriage device which moves an ink jet head in the above-mentioned conveyance direction and the direction of a right angle along the record section of the print sheet S in the outline perspective view of drawing 1.

[0021] The carriage device is equipped with the carriage 9 supported by a guide rod 64 and a guide rail 66 parallel to a print sheet S possible [ sliding ]. The head unit 11 and the ink tank 30 are carried in the carriage 9 possible [ desorption ]. The head unit 11 equips facing down S, i.e., a print sheet, and the sense which counters with the ink jet head so that it may mention later, breathes out ink to a print sheet S, and performs printing record. Carriage 9 is driven through a belt 70 by the CR motor 68.

[0022] Drawing 2 explains the head unit 11 to carriage 9, and the attachment device of the ink tank 30. Drawing 2 shows the carriage 9 in the condition of having removed the head unit 11 and the ink tank 30, and the head unit 11 which is really containing the ink jet head 10 a unit. The desorption of the ink jet head 10 to carriage 9 is possible by carrying out desorption of the head unit 11 whole. The ink tank 30 is not shown in this drawing 2.

[0023] The edge of the flexible signal cable 48 by which carriage 9 was connected to the record data generator (not shown) on the top face is attached through the press means 17, for example, backup rubber. The contact 16 for electric contact with the substrate 12 of the head unit 11 mentioned later is formed in the edge of the signal cable 48 on the backup rubber 17. Moreover, the crevice 20 which carried out opening is formed upwards on the top face of carriage 9, and the metal heat sink 18 as radiator material is attached in the frequent appearance direction movable to the interior. When opening marginal 20a of this crevice 20 is jutted out and formed in the inside and the head unit 11 is removed, that opening marginal 20a stops on the bottom protrusion edge of a heat sink 18, and escape of a heat sink 18 is prevented. When the head unit 11 is attached in carriage 9 in addition to this at carriage 9, hole 9A for letting the ink head 10 pass is prepared.

[0024] The alloy with which the quality of the material of a heat sink 18 makes a principal component aluminum or it with sufficient thermal conductivity also among metals is suitable. This heat sink 18 is formed in the location in contact with the driver IC 13 of the head unit 11, when the head unit 11 is attached in carriage 9. And between a heat sink 18 and carriage 9, it has the press means 19, for example, a flat spring, and when the head unit 11 is attached, he is trying for a driver IC 13 to press a heat sink 18.

[0025] On the other hand, the head unit 11 has the ink jet head 10, the driver IC 13 in which the drive circuit which drives the ink jet head 10 was established, and the substrate 12 with which the required circuit pattern was prepared while holding these. The ink jet head 10 and the driver IC 13 are connected to the circuit pattern on a substrate 12.

[0026] The circuit pattern on a substrate 12 contacts the contact 16 of a signal cable 48, when the head unit 11 is attached in carriage 9, and it supplies the data signal supplied from a record data generator to a driver IC 13. The ink jet head 10 has the injection nozzle of a large number which turn caudad and carry out opening, drives it based on a data signal from a driver IC 13, and carries out the regurgitation of the ink alternatively from an injection nozzle.

[0027] And the tank attaching part 14 for holding the ink tank 30 is attached in the rear face of a substrate 12, and the carrier ink port 15 which receives supply of ink from the ink tank 30 is established in the tank attaching part 14. In addition, the thing equivalent to a heat sink 18 is not prepared in the head unit 11.

[0028] The condition and the ink tank 30 which attached the head unit 11 in carriage 9 are shown in drawing 3. The ink tank 30 has stored ink in the interior, and the \*\* ink port 31 which supplies ink to the carrier ink port 15 of the head unit 11 is formed. It is equipped with the head unit 11 and the ink tank 30 possible [ desorption ] by the fixed means (not shown) which became independent to carriage 9, respectively so that it might be well-known.

[0029] Next, an operation of this ink jet recording device is explained.

[0030] If the head unit 11 is attached in carriage 9, as shown in drawing 3, the ink jet head 10 projects

through hole 9A. The ink jet head 10 is able to meet a print sheet S in this condition. At this time, the substrate 12 of the head unit 11 and the contact 16 of carriage 9 contact, and it will be in the condition that the data signal from a record data generator can be transmitted to a driver IC 13 through the circuit pattern prepared in the substrate 12. A substrate 12 and the contact 16 of each other are forced by the elasticity of backup rubber 17 here, and authenticity of electric contact is planned. Moreover, at this time, the driver IC 13 of the head unit 11 and the heat sink 18 of carriage 9 contact, and generation of heat by actuation of a driver IC 13 will be in the condition of being transmitted to a heat sink 18. Here, although the heat sink 18 and the driver IC 13 are separately formed in the carriage 9 and head unit 11 side from the first, a flat spring 19 turns a heat sink 18 to a driver IC 13, and is pressing it, and authenticity of contact is planned.

[0031] If the ink tank 30 is further attached in the head unit 11 on carriage 9 in this condition, the printing record which is basic actuation of an ink jet recording device will be attained. Printing record is performed as follows.

[0032] That is, it is sent until a print sheet S is conveyed by rotation of a roller 62 and the line recorded comes to the location which meets the ink jet head 10, and it is stopped there. And moving carriage 9 by the CR motor 68, ink is breathed out according to the record data with which the ink jet head 10 is sent from a record data generator, and printing record is performed. After record for one line is completed, a print sheet S is sent by one line with a roller 62, and record is continued about the line which follows.

[0033] Based on the record data transmitted through the signal cable 48 and the contact 16 from the record data generator, control of the ink jet head 10 in the case of this printing record is performed, when a driver IC 13 carries out various operations. Although this driver IC 13 generates remarkable heat by data processing for control of the ink jet head 10, this heat is transmitted to the heat sink 18 in contact with a driver IC 13, and stripping is carried out to atmospheric air. And by the elasticity of a flat spring 19, since it is certain, contact to a heat sink 18 and a driver IC 13 has the high transmission efficiency of the heat from a driver IC 13 to a heat sink 18, and a driver IC 13 does not serve as an elevated temperature too much. Therefore, the function of driver IC 13 the very thing is spoiled, and the property of ink changes with the heat and the evil of printing record becoming impossible etc. is prevented [ \*\*\*\* / that printing quality deteriorates ].

[0034] And in this ink jet recording apparatus, the desorption of the head unit 11 and the ink tank 30 is possible to carriage 9 as mentioned above. When the ink tank 30 becomes empty, the head unit 11 remains as it is, and exchanges only the ink tank 30. When [ both ] the ink jet head 10 breaks down or the color of the ink to print is changed, the ink tank 30 and the head unit 11 are exchanged. That is, the head unit 11 and the ink tank 30 are substitute parts. Since a heat sink 18 is not contained in the head unit 11 or the ink tank 30 which are a substitute part but is attached in the carriage 9 side, what has after [ the same ] exchange is used as it is here. Although this heat sink 18 is metal and it is a heavy lift, since it is not contained in the substitute part, the weight of a substitute part is low cost lightly.

[0035] The generating heat of the driver IC 13 when performing printing record, since he is trying to be contacted by the driver IC 13 if the heat sink 18 of a right thermal-conductivity metal is formed in carriage 9 in the ink jet recording apparatus which starts the gestalt of this operation as explained to the detail above and carriage 9 is equipped with the head unit 11 is transmitted to this heat sink 18, and stripping is carried out to atmospheric air. Therefore, the property of ink changes, printing quality deteriorates or printing record becomes [ it / that the function of driver IC 13 the very thing is spoiled or ] impossible. Since the same heat sink 18 is used as it is, and a signal cable 48 is also attached in a carriage 9 side and a substrate 12 is contacted even if a heat sink 18 is attached in the carriage [ not the head unit 11 grade that is a substitute part but ] 9 side here and it exchanges head unit 11 grade, the substitute part of head unit 11 grade is lightweight. For this reason, the outstanding ink jet recording device also with components cost low again is realized that it is easy to carry out exchange.

[0036] Moreover, since the heat sink 18 is attached in carriage 9 through the flat spring 19, when having equipped carriage 9 with the head unit 11, a heat sink 18 is pushed against a driver IC 13 by the elasticity of a flat spring 19, it is stuck, and its effectiveness of heat transfer from a driver IC 13 is good.

[0037] In addition, as for this invention, it is needless to say for amelioration various by within the limits

which is not limited to the gestalt of said operation and does not deviate from the summary of this invention and deformation to be possible. For example, in the gestalt of said operation, although the flat spring 19 was used as a means which pushes a heat sink 18 against a driver IC 13, a coil spring, rubber, etc. may be used instead.

[0038] Moreover, while forming the heat sink 18 in the carriage 9 side, although the thing equivalent to this is not prepared in the head unit 11 side, it is good also as dividing a heat sink into two, while preparing in a carriage 9 side, and preparing another side in the head unit 11 side. Even in this case, all the heat sinks are superior to the conventional ink jet recording device formed in the head unit side.

[0039]

[Effect of the Invention] According to invention of claim 1, the ink jet recording device which it prepared and had [ recording device ] radiator material in the carriage side, and decreased the weight and cost of a substitute part is offered like [ it is \*\*\*\*\* from having explained above and ].

[0040] And according to invention of claim 2, the ink jet recording device which was made to stick the radiator material which is a fixing component, and the drive circuit which is the heating element prepared in the substitute part side, and improved the absorption efficiency of heat is offered.

[0041] Moreover, according to invention of claim 3, while connecting a drive circuit with an ink jet head with the circuit pattern on a substrate, in support of them, a unit is constituted in a substrate, and the ink jet recording device which simplified structure of a substitute part is offered.

[0042] When equipping carriage with a unit furthermore according to invention of claim 4, the ink jet recording device which the drive circuit of a unit was contacted to radiator material, and made exchange easy is offered at the same time it connects a unit to the signal cable on carriage.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the outline configuration of an ink jet recording device.

[Drawing 2] It is the sectional view showing the configuration of carriage and a head unit in the state of separation.

[Drawing 3] While carriage and a head unit are shown in the state of wearing, it is the sectional view also showing an ink tank.

[Description of Notations]

9 Carriage

10 Ink Jet Head

11 Head Unit

12 Substrate

13 Driver IC (Drive Circuit)

16 Contact

18 Heat Sink (Radiator Material)

19 Flat Spring (Press Means)

48 Signal Cable

S Print sheet (recorded body)

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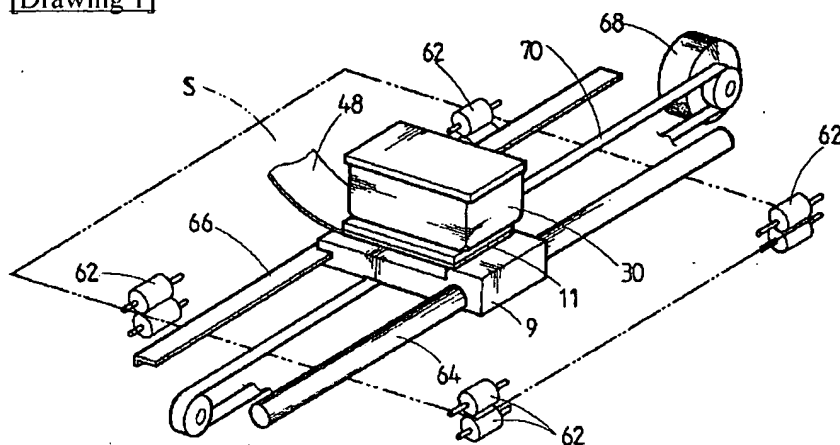
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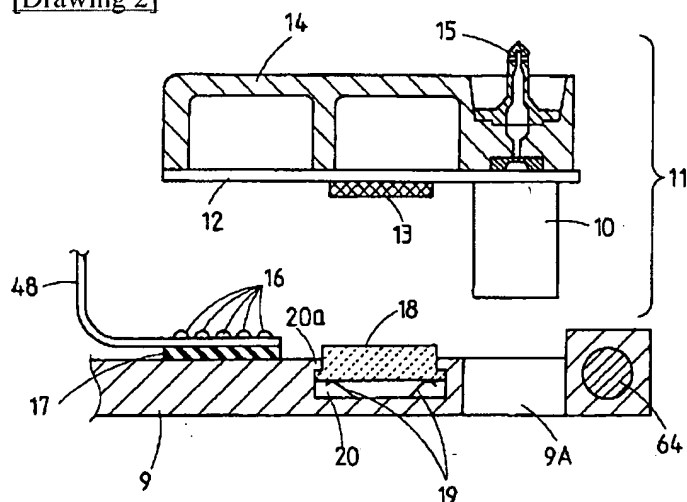
DRAWINGS

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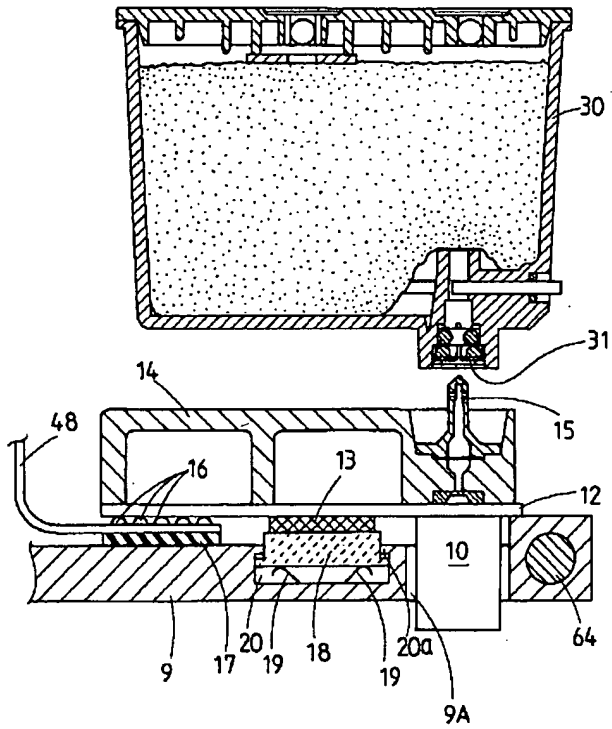
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]